REMARKS

Claims 1-31 were pending. In the advisory action mailed February 16, 2005, it was indicated that the amendments filed with Applicant's February 2, 2005 reply, when entered, would result in allowable claims 13, 20, 21, and 23, and rejected claims 1-12, 14-19, 22, 24-25, and 27-31 (claims 14 and 26 were canceled in the February 2, 2005 reply; the advisory action indicated that claim 23 was both allowable and rejected, and Applicant assumes the rejection to be a typographical error). Along with the accompanying Request for Continued Examination, Applicant has requested that the amendments in the February 2, 2005 reply be entered. The claims list submitted with the present amendment assumes entry of the February 2, 2005 amendment, and present further modifications to the February 2 claim set.

The present amendment amends claims 1, 5, 15, and 29, cancels independent claim 23, and presents a new independent claim 32. Accordingly, claims 1-13, 15-22, 24-25, and 27-32 are presently active in the application. Reconsideration of the application as amended is respectfully requested.

Change of Address

Applicant has filed herewith a new Power of Attorney and Change of Address form, and has noted a new docket number, which Applicant mentions herein in order to alert the Examiner should the papers be separated. Applicant respectfully requests that any telephone communication be directed to James E. Harris at the number noted at the end of this paper.

Claim Amendments

Claim 1 is amended to explicitly define what is meant in that claim by the phrase "weight of packets." An input port weight of packets, as now further delimited the claim, is based on the amount of data accumulated at that input port for forwarding to a particular output port. This concept is supported, e.g., by the original specification at page 4, lines 28-38. Claims 1 and 15 were amended to clarify that the connections between multiple input ports and output ports are concurrent connections—see, e.g., claim 27 which recites the scheduler configuration for multiple connections "at the same time."

Claim 5 was amended to correct an antecedent basis problem with respect to "a next time slot."

Claim 29 was amended to claim "a weight based on a number of bytes in the packet for a virtual output buffer" in similar fashion to claim 1. In addition to the specification

reference given above, this amendment is also supported by the claim 15 language "a weight that varies according to a number of packet bytes in the input port buffers."

Claim 32 is drawn to a packet scheduler, and draws from similar multi-phase arbitration concepts found in the claim 31 network processing device and claim 18 scheduling method. The input circuitry to receive queue status is illustrated in one embodiment by the scheduler connection to bus 18 (Figures 1 and 2) over which virtual output queue information is transmitted (pages 3 and 4). The multi-phase arbitration performed by the arbiter is described, e.g., in Figure 5 and accompanying text. See also the claim 2 recitation of a scheduler that conducts "another arbitration phase" and the claim 7 recitation of a scheduler that conducts output port arbitrations and input port arbitrations.

Applicant respectfully submits that the claims as presently constituted are supported by the original specification, and that no new matter has been added by this amendment.

Response to Claim Rejections – 35 U.S.C. § 103

Claims 1-4, 6-8, 14-18, 24-26, and 31 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Frannson (US 6,445,706) in view of Chao (US 6,667,984). Claims 5, 11-12, and 27-30 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Fransson in view of Chao, and further in view of Holden et al. (US 6,188,690). Claims 9-10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Fransson in view of Chao, and further in view of DeGrandpre et al. (US 6,678,275). Claims 19 and 22 were rejected under 35 U.S.C. 103(a) as being unpatentable over Fransson in view of Chao, and further in view of Dunstan (US 6,654,371).

Applicant has included herein many of the arguments presented in the February 2, 2005 reply, expanded where possible to respond to the Examiner's remarks in the February 16, 2005 Advisory Action. Applicant respectfully traverses the outstanding rejections and submits that they fail to create a *prima facie* case of obviousness for any rejected claim, as the rejections fail to indicate the presence of many claimed limitations in the references.

Before two or more references can be combined to make a *prima facie* case, the rejection must demonstrate that the references teach or suggest all elements of the claimed invention—this is the basic criteria required for a *prima facie* case that Applicant specifically argues is missing from the references and the rejection. *See, e.g., Manual of Patent Examining Procedure*, § 2143, Basic Requirements of a *Prima Facie* Case of Obviousness ("[f]inally, the prior art reference (or references when combined) must teach or suggest all the

claim limitations."). A *prima facie* case of obviousness is therefore lacking for any claim when the Examiner has not shown where each claim limitation is supported in the references, and the Applicant does not acquiesce in a general assertion by the Examiner that the references teach the claim limitations. Such is the case here. A *prima facie* case must be presented for each rejected claim, and must demonstrate each claim limitation in the prior art.

Claims 1, 6, 9, and 10

Claim 1 recites a packet scheduler comprising "inputs configured to receive requests for connecting multiple input ports to multiple output ports and outputs for configuring multiple concurrent connections according to a matching between the multiple input ports and the multiple output ports." The rejection fails to identify the existence in the prior art of a packet scheduler with the recited inputs and outputs. Frannson's scheduler does not have inputs to receive requests, and is in fact silent as to how packets from multiple inputs resolve contention for his output queues. Frannson also fails to disclose outputs for configuring connections between ports—his scheduler merely visits each output link in round robin fashion and selects an output queue to provide a cell for that link. There is no disclosure of any configured connections between multiple input and output ports or an arbiter having outputs for configuring such connections.

The Advisory Action states that the above argument is "not persuasive because without a configured connection, a packet enters an input port will not be able to route through the switch to the right output port." Applicant respectfully disagrees as Frannson places packets in a common set of intermediate queues, from which at some point the packets are later forwarded to an output port—all without ever forming a connection between an input port and an output port. Applicant did not argue that Frannson could not successfully route packets, but that this was not accomplished by an arbiter configuring connections (plural) between the input ports and output ports. To further clarify the difference, Applicant has amended claim 1 to specify that the connections are multiple and concurrent. In contrast, Frannson does not disclose per-input-port queuing, but per-class per-output port queuing in a set of queues fed through a switch S1 (Fig. 1) or S9 (Fig. 3) that serves all input ports (Frannson, col. 2, ll. 17-45). It is these per-class queues, which are not associated with any particular input ports, that Frannson arbitrates, and therefore Frannson has no arbiter with outputs configuring multiple concurrent connections according to a matching between the multiple input ports and the multiple output ports.

As for Chao, that reference employs multiple distributed arbiters, one at each port, and discloses no packet scheduler with the disclosed inputs and outputs. Each of Chao's mini-arbiters can receive requests for connecting multiple input ports to the single output port associated with that arbiter, (see Chao Figs. 10 and 11), but no arbiter receives requests for multiple output ports as claimed. None of Chao's distributed arbiters has outputs for configuring multiple concurrent connections, but grants at most a single connection.

Thus neither reference discloses a packet scheduler with inputs configured to receive requests for connecting multiple input ports to multiple output ports. And neither reference discloses a packet scheduler with outputs for configuring multiple concurrent connections according to a matching between the multiple input ports and the multiple output ports.

Claim 1 also recites that the arbiter conducts multiple independent arbitrations that select input ports for the next time slot "according to both a priority and weight of packets at the input ports used for the arbitrations." (emphasis added) The rejection fails to identify the existence in the prior art of the claimed input port selection. Although Frannson's disclosure pairs output queues (instead of the claimed input ports) with output ports, even this teaching fails to disclose using both priority and weight in arbitration. Frannson discloses using priority, but never inquires or uses weight to arbitrate (see, e.g., Frannson Fig. 5 block 144, which resolves priority ties using sequence number, not weight). Chao does nothing to cure this deficiency.

The Advisory Action states that the Examiner disagrees with the above argument "because Fransson clearly discloses this limitation in col. 1, line 46." The cited sentence refers to a fairness guarantee between all connections "according to both their priority class and their logical weight." The concept of connection "logical weight" is further explained by Fransson at col. 2, ll. 51-65—this concept refers to the frequency with which each connection is served. In contrast, "weight" as used by Applicant is not a connection weight, but a "weight of packets." Applicant has amended claim 1, using language from the specification, to further clarify that "weight of packets" for an output port arbitration is "based on the amount of data accumulated at [an] input port for forwarding to [an] output port related to that arbitration." This concept is missing from both references, and is not suggested by Fransson's "logical weight."

Neither reference describes a packet scheduler comprising an arbitration circuit that performs "multiple independent arbitrations ... concurrently for each of the multiple output ports." Fransson can only arbitrate for one output port at a time, given his queue structure

(and the fact that his queues are output queues). Chao uses multiple arbitration circuits, each associated with a single port, none of which perform multiple independent arbitrations.

Accordingly, considering the applied references together, they fail to teach every element of the claimed invention, and therefore fail to create a *prima facie* case of obviousness. Applicant respectfully requests that the rejection of claims 1 and 6 be withdrawn.

Claim 2

Regarding claim 2, the rejection and the Advisory Action fail to identify where the references teach input ports winning multiple arbitrations, all but one of which are rejected, and then the arbitration circuit conducting another arbitration phase for the output ports that were rejected in the first arbitration phase. Fransson does not even disclose input ports contending for output ports. Chao's input ports cannot "win" multiple arbitrations because each input port only requests a single output port and thus can win at most one arbitration. Accordingly, the rejection fails to create a *prima facie* case of obviousness for claim 2.

Claim 3

Regarding claim 3, the rejection and the Advisory Action fail to identify where the references teach the scheduler including timers that are activated with a request, and the arbitration circuit increasing the priority for any input ports having unserviced connection requests extending beyond a timer period. Accordingly, the rejection fails to create a *prima facie* case of obviousness for claim 3.

Claim 4

Regarding claim 4, the rejection and the Advisory Action fail to identify where the references teach an arbitration circuit that conducts output port arbitrations for each output port and input port arbitrations for input ports winning multiple output port arbitrations. Fransson arbitrates priority queues, and thus input ports cannot "win" any arbitration or arbitrate between multiple wins. Chao's arbitration circuits each perform a single arbitration, and none perform an input port arbitration for input ports winning multiple output port arbitrations. Accordingly, the rejection fails to create a *prima facie* case of obviousness for claim 3.

Claim 5

Regarding claim 5, Holden et al. is cited for the proposition that multicast/unicast arbitration is well known in the art. While Holden et al. does disclose arbitration between multicast and unicast cells within a switch fabric for cells already input to that switch fabric by input ports, it fails (as do the other references) to disclose what is claimed—output port arbitrations and input port arbitrations conducted for both multicast and unicast packets. Accordingly, the rejection fails to create a *prima facie* case of obviousness for claim 5.

The Advisory Action states that the Examiner disagrees "because Chao clearly discloses input port arbitrations (input arbiters) in Figure 11." Chao Figure 11 does not illustrate multicast packet and unicast packet input port arbitration, as is claimed, and no reference suggests such a limitation. Furthermore, the claimed "input port arbitrations" are the claim 4 arbitrations, which are for "input ports winning multiple output port arbitrations." As discussed above, this is impossible with Chao.

Claim 7

Claim 7, like claim 4, includes an arbitration circuit that conducts the output port arbitrations and input port arbitrations. A *prima facie* case of obviousness is missing for claim 7 at least for the same reasons as it is missing for claim 4.

Claim 8

Regarding claim 8, the rejection and the Advisory Action fail to identify where the references disclose output port arbitrations and input port arbitrations conducted according to both priority and number of bytes of the packets associated with virtual output queues. Accordingly, the rejection fails to create a *prima facie* case of obviousness for claim 8.

Claim 11

Regarding claim 11, the rejection and the Advisory Action fail to identify in the prior art an arbitration circuit conducting a multicast arbitration and then conducting a unicast arbitration for the same time slot for any remaining unassigned output ports. The referenced section of Holden discloses performing both multicast and unicast arbitration for the same paths, and then "arbitrating between the two solutions to determine which traffic actually flows." This neither teaches nor suggests performing a multicast arbitration and then performing a unicast arbitration only for remaining unassigned output ports. Accordingly,

the rejection fails to create a *prima facie* case of obviousness for claim 11.

Claim 12

Regarding claim 12, the rejection and the Advisory Action fail to identify in the prior art the claim 11 scheduler, wherein the multicast and unicast arbitrations are conducted for both output port arbitrations and input port arbitrations as recited in claim 12. As discussed regarding claim 5, Holden's switch fabric performs no input port arbitrations, and therefore certainly does not teach or suggest multicast and unicast input port arbitration. Accordingly, the rejection fails to create a *prima facie* case of obviousness for claim 12.

Claim 15 and 24

Regarding claim 15, the rejection and the Advisory Action fail to identify in the prior art a method for scheduling connections where arbitration parameters include a weight that varies according to a number of packet bytes in the input port buffers and a priority of the packets in the input port buffers. Fransson does not even disclose input port buffers, and his arbitration between priority buffers includes no weight that varies according to a number of packet bytes. Chao uses neither weight nor priority. The Examiner is respectfully referred to the discussion above regarding claims 1 and 2 for further reasons supporting the patentability of claim 15. Accordingly, the rejection fails to create a *prima facie* case of obviousness for claims 15 and 24.

Claims 16-17 and 25

Dependent claims 16-17 and 25 claim additional features using the claim 15 elements identified above as missing in the prior art. As these features are also not disclosed or identified in the rejection, the rejection fails to create a *prima facie* case of obviousness for claims 16-17 and 25.

Claim 18

Regarding claim 18, the Examiner is respectfully referred to the discussion above regarding claims 1 and 2 for reasons supporting the patentability of claim 18. Neither applied reference nor the rejection identify the claim 18 limitation of conducting second independent arbitrations for output ports that did not receive a grant acceptance and input port buffers that did not previously receive grants. Accordingly, the rejection fails to create a *prima facie* case

of obviousness for claim 18.

Claims 19 and 22

Regarding the original claim 19 limitations and the additional claim 22 limitations, the rejection fails to identify the references teaching these limitations. Dunstan does not teach what is missing from Fransson and Chao, including conducting a multicast arbitration, granting one of the input port buffers winning the multicast arbitration all output ports identified in an associated multicast group vectors, and conducting output port and input port arbitrations as claimed. The references also fail to teach or suggest the claim 22 unicast arbitration after multicast arbitration. Accordingly, the rejection fails to create a *prima facie* case of obviousness for claims 19 and 22.

Claims 27-30

Regarding claim 27, that claim includes a scheduler and multiple virtual output buffers, "wherein the scheduler conducts a multicast arbitration before each time slot to select virtual output buffers to connect to multiple output ports, the scheduler then conducting a unicast arbitration for connecting any unselected virtual output buffers to unselected output ports." The rejection fails to identify the references teaching the claimed multicast/unicast arbitration sequence. The referenced section of Holden discloses performing both multicast and unicast arbitration for the same paths, and then "arbitrating between the two solutions to determine which traffic actually flows." This neither teaches nor suggests performing a multicast arbitration and then performing a unicast arbitration only for remaining unassigned output ports.

Claims 28-30 add further limitations to this multicast/unicast limitation. For instance, as discussed above regarding claim 1, the claim 29 limitation for issuing grants according to a weight based on a number of bytes in the packets for an virtual output buffer is neither taught nor suggested by the references. Accordingly, the rejection fails to create a *prima facie* case of obviousness for claims 27-30.

Claims 31 and 32

Regarding claim 31, the rejection and the Advisory Action fail to identify in the prior art a network processing device with a scheduler as claimed. For instance, the references neither teach nor suggest a scheduler that conducts second independent arbitrations for

unmatched input and output ports. Accordingly, the rejection fails to create a *prima facie* case of obviousness for claim 31.

New claim 32 claims a packet scheduler with an arbitration circuit that conducts a multi-phase arbitration for a plurality of input ports and a plurality of output ports. The scheduler comprises input circuitry to receive queue status for a plurality of input ports identifying the output ports for which that input port has data queued for transmission. The references fail to teach or suggest such a scheduler, and thus claim 32 is believed patentable.

CONCLUSION

For the foregoing reasons, reconsideration and allowance of the application as amended is solicited. The Examiner is encouraged to telephone the undersigned at (512) 867-8502 if it appears that an interview would be helpful in advancing the case.

Respectfully submitted,

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